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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Ryoichi Ito

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EXAMINER

MAI, ANH D

ART UNIT

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/523,799	<b>Applicant(s)</b> ITO ET AL.	
	<b>Examiner</b> Anh D. Mai	<b>Art Unit</b> 2814	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 July 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 May 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Status of the Claims***

1. Amendment filed July 5, 2007 is acknowledged. Claims 1-6 and 13-15 have been amended. Claims 16 and 17 have been added. Claims 1-17 are pending.

### ***Drawings***

2. The drawings were received on May 23, 2007. These drawings are acceptable.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 2, 5, 8, 11 and 14; 3, 6, 9, 12 and 15 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

With respect to claims 2, 5, 8, 11 and 14, claim 2 depends on claim 1, thus, the limitations of claim 2 includes: the plug extend into the semiconductor region of the first conductivity type beyond the isolation region (limitation of claim 1, last two lines) and wherein the plug is located so as to surround each light-receiving element.

According to the Applicant's argument in the Remarks, the "plug formed of a conductor of present claim 1 differs from the semiconductor region (13/14) of Ito" (Remarks page 13, lines 2-3).

Which means, according to the Applicant, doped silicon (P+ 17) is not considered to be the “plug”.

In the embodiment, Fig. 2, that shows the “plug” 14 surrounding the light-emitting element, in this embodiment, the “plug” 14 is never extended beyond the isolation region 6.

In another embodiment, Fig. 3, where the “plug” 18 extends beyond the isolation region 6, but the “plug” 18 does not surround the light-emitting region.

Therefore, claim 2, claiming the limitation “where the plug is located so as to surround each light-emitting element” and “extends beyond the isolation regions” do not appear to have a written description support.

Therefore, claims 2, 5, 8, 11 and 14 contain new matters.

With respect to claim 3, 6, 9, 12 and 15, claim 3 recites: the plug contacts the middle layer of the semiconductor region of the first conductivity type.

As shown in Fig. 3, the “plug” 18 has never contacted the middle layer 15, only portion 17 does, again according the argument in the Remarks, the doped portion 17 is not considered to be the “plug”.

Therefore, claims 3, 6, 9, 12 and 15 contain new matters.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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4. Claims 2, 5, 8, 11 and 14 are further rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Since claim 2 combining limitations of two mutually exclusive embodiments, (a) extends beyond the isolation region and (b) surrounding the light-emitting element, while the specification does not explicitly indicated that they (embodiments of Fig. 2 and 3) can be combined.

Therefore, claim 2, 5, 8, 11 and 14 are indefinite.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 4, 7, 10, 13, 16 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Ito et al. (JP. Pub. No. 2002-280536) of record.

With respect to claim 1, Insofar as the apparatus is concerned and as best understood by the examiner, Ito teaches an optical semiconductor device as claimed including:

a plurality of light-receiving elements (1) comprising a semiconductor region (2) of a first conductivity type and a semiconductor region (3) of a second conductivity type formed on the semiconductor region (2) of the first conductivity type;

an isolation region (6) including insulator or a dielectric (oxide) disposed in the semiconductor region (3) of the second conductivity type and contacting the semiconductor region (2) of the first conductivity type in order to isolate the light-receiving elements;

an electrode (15) disposed above the isolation region (6); and

a plug comprising a conductor (13/14) which extends through the isolation region (6) and contacts the semiconductor region (2) of the first conductivity type in order to electrically connect the electrode (15) and the semiconductor region (2) of the first conductivity type, wherein

the plug extends into the semiconductor region (6) of the first conductivity type beyond the isolation region. (See Figs. 3, 5).

With respect to claim 4, a high-concentration region (13) of the first conductivity type having an impurity concentration ( $P_+$ ) higher than the impurity concentration ( $P_-$ ) of the semiconductor region (2) of the first conductivity type is provided directly under the plug (13/14).

With respect to claims 7 and 10, the conductor (13/14) is doped silicon thus the limitation is met.

With respect to claim 13, the optical semiconductor device of Ito further includes a circuit (16) connected to the light-receiving element (1) on the semiconductor region (2) of the first conductivity type other than the region in which light-receiving element (1) is disposed.

With respect to claim 16, the plug (13/14) of Ito is surrounded by the insulator or dielectric (6).

With respect to claim 17, the plug (13/14) of Ito is not adjacent to the light-receiving element (1).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2, 3, 5-12, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito '536 as applied to claim 1 above, and further in view of Takimoto et al. (U.S. Patent No. 6,380,603) of record.

With respect to claim 2, Ito teaches the optical semiconductor device as described in claim 1 above including the plug (13/14) comprising a conductor which extend through the isolation region (6).

Thus, Ito is shown to teach all the features of the claim with the exception of the contact portion is surrounding each light-receiving element.

However, Takimoto teaches an optical semiconductor device including a contact portion is formed by burying a conductor (4/8) in the opening and surrounding each light-receiving element (7). (See Fig. 7).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form the conductive plug of Ito to surround the light-receiving element as taught

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by Takimoto to isolate the light-receiving element from other devices, thus interference is prevented.

With respect to claim 3, the semiconductor region of the first conductivity type of Takimoto comprises an upper layer (3), a middle layer (2), and a lower layer (1), the impurity concentration of the middle layer (2) of the first conductivity type is higher than that of the upper (3) and lower (1) layers, the plug (4/8) contacts the middle layer (2) of the semiconductor region of the first conductivity type.

With respect to claims 5 and 6, a high-concentration region (13) of the first conductivity type of Ito having an impurity concentration (P+) higher than the impurity concentration (P-) of the semiconductor region (2) of the first conductivity type is provided directly under the plug (13/14).

With respect to claims 7-12, it is further noted that, although Ito does not explicitly disclose the conductor plug (13/14) being polysilicon, however, an Official notice is taken that, since the semiconductor of Ito is silicon, thus the doped semiconductor of Ito is doped silicon. Moreover, the conductivity of the doped (P+) silicon 13/14 should at least meet or exceed the conductivity of the claimed doped polysilicon and the use of doped polysilicon or doped silicon for conductive plug are obvious choices of one having ordinary skill in the art.



With respect to claims 14 and 15, the optical semiconductor device of Ito further includes a circuit (16) connected to the light-receiving element (1) on the semiconductor region (2) of the first conductivity type other than the light-receiving element-formed region (1) is disposed.

### ***Response to Arguments***

7. Applicant's arguments filed July 5, 2007 have been fully considered but they are not persuasive.

### **Rejection under 35 U.S.C. 102(b)**

With respect to claim 1, Applicant argues:

*In other words, Ito's anode-leading region 13 and anode contacting region 14 are **semiconductor regions**. In this regard, it is noted that the office action erroneously asserts that anode-leading region 13 and anode contacting region 14 are polysilicon or tungsten.*

Applicant erroneously asserts that the anode contacting regions 14 are semiconductor regions. In fact, contact regions 14 are heavy doped ( $P^+$ ) silicon and truly conductors.

Regarding the plug, claim 1 recites: “a plug comprising **a conductor** which extend through the isolation region and contacts the semiconductor region of the first conductivity type”.

From Figs. 3 and 5, Ito clearly teaches the plug comprising a conductor (13/14) **extends through** the isolation region (6) and **contacts** the semiconductor region (2) of the first conductivity type (p).

Note that, in its broadest interpretation, the term “conductor” is not just for conducting metal but also includes all things that are electrically conductive.

All limitations of claim 1 are met, thus, claims 1, 4, 7, 10, 13 16(new) and 17(new) are anticipated by Ito.

**Rejection under 35 U.S.C. 103(a)**

Since Ito anticipated the limitations of claim 1 as discussed above, the combination of Ito and Takimoto clearly renders claims 2, 3, 5-12, 14 and 15 obvious.

***Conclusion***

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 8:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Anh D. Mai/  
Primary Examiner, Art Unit 2814